Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_\_

**Water Potential Practice Worksheet #2**

Mrs. Krouse, AP Biology

*\*\*\*Thank you to Ms. Glick for providing this assignment!\*\*\**

1. If a plant cell’s ΨP = 2 bars and its Ψs = -3.5 bars, what is the resulting Ψ?

Ψ = Ψs +ΨP 🡪 Ψ = -3.5 + 2 = **-1.5 bars**

1. The plant cell from Question #1 is placed in beaker of sugar water with Ψs = -4.0 bars. In which direction will the net flow of water be (into or out of the plant cell)?

**Water will move out of the plant cell** from a high water potential (-1.5 bars) inside the cell towards a low water potential (-4.0 bars) outside the cell.

1. The original cell from Question #1 is placed in a beaker of sugar water with Ψs = -0.15 MPa (megapascals). We know that 1 MPa = 10 bars. In which direction will the net flow of water be?

-0.15 MPa x (10 bars / 1 MPa) = -1.5 bars

**Water will move into and out of the cell but at the same rate** because the water potential of the cell is equal to the water potential of the sugar water.

1. The value for Ψ in root tissue was found to be -3.3 bars. If you place the root tissue in a 0.1 M solution of sucrose at 20 degrees Celsius in an open beaker, what is the Ψ of the solution, and in which direction will the net flow of water be?

Ψs = -iCRT 🡪 Ψs = -(1)(0.1)(0.0831)(20 +273) = **-2.4 bars**

Since the sucrose solution is in an open beaker, the water potential (Ψ) is equal to the solute potential (Ψs) because the pressure potential (ΨP) is zero.

**Water will move into the root cells** from high water potential (-2.4 bars) in the sucrose solution to a low water potential (-3.3 bars) in the root cells.

1. NaCl dissociates (breaks down) into two particles in water—Na+ and Cl-. If the solution in Question #4 contained 0.1 M NaCl instead of 0.1 M sucrose, what is the Ψ of the solution, and in which direction will the net flow of water be?

Ψs = -iCRT 🡪 Ψs = -(2)(0.1)(0.0831)(20 +273) = **-4.8 bars**

Since the NaCl solution is in an open beaker, the water potential (Ψ) is equal to the solute potential (Ψs) because the pressure potential (ΨP) is zero.

**Water will move out of the root cells** from high water potential (-3.3 bars) in the root cells to a low water potential (-4.8 bars) in the NaCl solution.

1. A plant cell with a Ψs of -7.5 bars keeps a constant volume when immersed in an open-beaker solution that has Ψs of -4 bars. What is the cell’s ΨP?

Ψs of open beaker solution = Ψ (because the pressure potential is zero). The water potentials (Ψ) of the plant cell and the external solution must be equal if there’s no overall movement of water into or out of the cell.

Ψ of plant cell = Ψs +ΨP 🡪 -4 = -7.5 + ΨP 🡪 ΨP = **3.5 bars**

1. At 20 degrees Celsius, a plant cell containing 0.6 M glucose is in equilibrium with its surrounding solution containing 0.5 M glucose in an open container. What is the cell’s ΨP?

*Note: Glucose does not break down into multiple particles in water.*

Ψs of open beaker solution = -iCRT 🡪 Ψs = -(1)(0.5)(0.0831)(20 +273) = -12.2 bars

Ψs of open beaker solution = Ψ (because the pressure potential is zero). The water potentials (Ψ) of the plant cell and the external solution must be equal if they are in equilibrium with each other.

Ψ of plant cell = -12.2 bars

Ψs of plant cell = -iCRT 🡪 Ψs = -(1)(0.6)(0.0831)(20 +273) = -14.9 bars

Ψ of plant cell = Ψs +ΨP 🡪 -12.2 = -14.9 + ΨP 🡪 ΨP = **2.7 bars**